WHAT IS CLAIMED IS:

1. An apparatus configured to control a magnetic field strength of a magnetic lens during use, comprising:

a magnetic sensor disposed within a magnetic field generated by the magnetic lens, wherein the magnetic sensor is configured to generate an output signal during use, and wherein the output signal is responsive to a first magnetic field strength generated by the magnetic lens; and

a control circuit coupled to the magnetic sensor and the magnetic lens, wherein the control circuit is configured:

to receive the output signal from the magnetic sensor during use;

to receive an input signal responsive to a predetermined magnetic field strength during use;

to generate a control signal responsive to the output signal and the input signal during use; and

to apply a current to the magnetic lens, wherein the current is responsive to the control signal.

2. The apparatus of claim 1, wherein the magnetic lens is configured to apply a magnetic field to a charged particle beam during use.

3. The apparatus of claim 1, wherein the magnetic lens is coupled to a scanning electron microscope.

4. The apparatus of claim 1, wherein the input signal comprises a voltage having a linear relationship to the predetermined magnetic field strength of the magnetic lens.

5. The apparatus of claim 1, wherein the output signal comprises a voltage having a linear relationship to the first magnetic field strength of the magnetic lens.

6. The apparatus of claim 1, wherein the control signal is responsive to a function of the output signal and the input signal.

7. The apparatus of claim 1, wherein the control circuit is further configured to apply a current to at least one coil of the magnetic lens.

8. The apparatus of claim 1, wherein the applied current is effective to generate a second magnetic field strength within the magnetic lens, and wherein the second magnetic field strength is closer to the predetermined magnetic field strength than the first magnetic field strength.

9. The apparatus of claim 1, wherein the applied current is effective to generate a second magnetic field strength within the magnetic lens, and wherein the second magnetic field strength is substantially the same as the predetermined magnetic field strength.

10. The apparatus of claim 1, wherein the apparatus is further configured to continuously control the magnetic field strength of the magnetic lens during use.

11. The apparatus of claim 1, wherein the apparatus is further configured to intermittently control the magnetic field strength of the magnetic lens during use.

12. The apparatus of claim 1, wherein the magnetic sensor is disposed within a magnetic fringe field area of the magnetic lens.

13. The apparatus of claim 1, wherein the magnetic sensor is disposed within a cavity in the magnetic lens, and wherein the cavity is disposed between an outer pole piece of the magnetic lens and an inner pole piece of the magnetic lens.

14. The apparatus of claim 1, wherein the magnetic sensor is disposed within an inner pole piece of the magnetic lens.

15. The apparatus of claim 1, further comprising a temperature sensor coupled to the magnetic lens, wherein the temperature sensor is configured to generate a temperature signal during use, and wherein the temperature signal is responsive to a temperature of the magnetic lens.

16. The apparatus of claim 15, wherein the temperature sensor is further coupled to the magnetic sensor, wherein the magnetic sensor is further configured to receive the temperature signal during use and to generate an output signal during use, and wherein the output signal is further responsive to the temperature of the magnetic lens.

17. The apparatus of claim 1, wherein the control circuit comprises a low-pass circuit element configured to receive the output signal during use and to reduce fluctuations in the output signal during use.

18. The apparatus of claim 1, wherein the control circuit comprises an operational amplifier configured to generate a comparison signal during use, wherein the comparison signal is responsive to a comparison of the output signal and the input signal, and wherein the control signal is further responsive to a function of the comparison signal.

19. The apparatus of claim 1, wherein the control circuit comprises an electronic current drive system configured to receive the control signal during use and to apply the current to the magnetic lens during use.

20. A method for controlling a magnetic field strength of a magnetic lens, comprising:

generating an output signal in response to a first magnetic field strength generated by the magnetic lens;

generating an input signal in response to a predetermined magnetic field strength;

generating a control signal in response to the output signal and the input signal; and

applying a current to the magnetic lens, wherein the current is responsive to the control signal.

21. The method of claim 20, further comprising directing a charged particle beam through the magnetic lens such that the magnetic field is applied to the charged particle beam.

22. The method of claim 20, wherein the magnetic lens is coupled to a scanning electron microscope.

23. The method of claim 20, wherein the input signal comprises a voltage having a linear relationship to the predetermined magnetic field strength.

24. The method of claim 20, wherein the output signal comprises a voltage having a linear relationship to the magnetic field strength of the magnetic lens.

25. The method of claim 20, wherein the control signal is generated in response to a function of the output signal and the input signal.

26. The method of claim 20, wherein applying a current to the magnetic lens comprises applying a current to at least one coil of the magnetic lens.

27. The method of claim 20, wherein applying a current to the magnetic lens comprises generating a second magnetic field strength within the magnetic lens, and wherein the second magnetic field strength is closer to the predetermined magnetic field strength than the first magnetic field strength.

28. The method of claim 20, wherein applying a current to the magnetic lens comprises generating a second magnetic field strength within the magnetic lens, and wherein the second magnetic field strength is substantially the same as the predetermined magnetic field strength.

29. The method of claim 20, further comprising performing the method continuously.

30. The method of claim 20, further comprising performing the method intermittently.

31. The method of claim 20, further comprising generating a temperature signal in response to a temperature of the magnetic lens.

32. The method of claim 20, further comprising generating a temperature signal in response to a temperature of the magnetic lens and generating the output signal in response to the temperature of the magnetic lens.

33. The method of claim 20, further comprising reducing fluctuations in the output signal using a low-pass circuit element.

34. The method of claim 20, further comprising generating a comparison signal in response to a comparison of the output signal and the input signal, wherein generating the control signal comprises applying a gain to the comparison signal.

35. A system configured to inspect a specimen during use, comprising:

at least one magnetic lens configured to apply a magnetic field to a charged particle beam during use, wherein the magnetic lens is positioned along a path of the charged particle beam; and

an apparatus configured to control a magnetic field strength generated by the magnetic lens during use, wherein the apparatus is coupled to the magnetic lens and the system, the apparatus comprising:

a magnetic sensor disposed within the magnetic field generated by the magnetic lens, wherein the magnetic sensor is configured to generate an output signal during use, and wherein the output signal is responsive to a first magnetic field strength generated by the magnetic lens; and

a control circuit coupled to the magnetic sensor and the magnetic lens, wherein the control circuit is configured:

to receive the output signal from the magnetic sensor during use;

to receive an input signal responsive to a predetermined magnetic field strength during use;

to generate a control signal responsive to the output signal and the input signal during use; and

to apply a current to the magnetic lens, wherein the current is responsive to the control signal.

36. The system of claim 35, wherein the system comprises a scanning electron microscope.

37. The system of claim 35, wherein the specimen is fabricated using a semiconductor manufacturing process.

38. The system of claim 35, further comprising a charged particle beam source configured to produce the charged particle beam during use.

39. The system of claim 35, further comprising a stage configured to support at least a portion of the specimen during use.

40. A method for inspecting a specimen, comprising:

generating a magnetic field by a magnetic lens and applying the magnetic field to a charged particle beam, wherein applying the magnetic field to the charged particle beam comprises directing the charged particle beam through the magnetic lens; and

controlling a magnetic field strength of the magnetic lens, comprising:

generating an output signal in response to a first magnetic field strength generated by the magnetic lens;

generating an input signal in response to a predetermined magnetic field strength;

generating a control signal in response to the output signal and the input signal; and

applying a current to the magnetic lens, wherein the current is responsive to the control signal.

41. The method of claim 40, wherein the magnetic lens is coupled to a scanning electron microscope.

42. The method of claim 40, further comprising fabricating the specimen using a semiconductor manufacturing process.

43. The method of claim 40, further comprising generating the charged particle beam using a charged particle beam source.

44. The method of claim 40, further comprising positioning at least a portion of the specimen on a stage prior to said directing.

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